DCR Storrow Drive Tunnel Project

RESPONSE TO ADVISORY COMMITTEE QUESTIONS REGARDING THE SIX CURRENT STORROW DRIVE RECONSTRUCTION OPTIONS (Options A, B, B-3, C, D, D-3)

Questions Posed by Bob O'Brien, Downtown North Association, and other Committee Members in Comment Letters to Commissioner Sullivan

Responses Prepared by DCR and its consultants for the Storrow Drive Tunnel Project

A. WITH RESPECT TO ALL OF THE OPTIONS:

(a) Parkland Impacts during Construction:

- **Are the quality, quantity and duration of parkland impacts – e.g., the cutting of trees, the use of parkland space for construction staging purposes, the temporary loss of parkland use during construction -- subject to NEPA Section 4(f) standards and/or comparable MEPA requirements?**

  Response: The Storrow Drive Tunnel project is state funded. Section 4(f) standards do not apply to non-federally funded projects[1]; however, the project is subject to Massachusetts Environmental Policy Act review (MEPA).

  Review of the project under MEPA was initiated when an Environmental Notification Form (ENF) was filed in April 2006. The Draft Environmental Impact Report (DEIR) is currently being prepared for submittal. The purpose of MEPA review is "to provide meaningful opportunities for public review of the potential environmental impacts of Projects for which Agency Action is required, and to assist each Agency in using… all feasible means to avoid Damage to the Environment or, to the extent Damage to the Environment cannot be avoided, to minimize and mitigate Damage to the Environment to the maximum extent practicable" (301 CMR 11.01(1)(a)). The DEIR provides a discussion of park impacts and of alternatives examined that could

[1] The Section 4(f) referred to was enacted as Section 4(f) of the United States Department of Transportation (USDOT) Act of 1966. Section 4(f) states that land from a significant publicly owned park, recreation area, wildlife or waterfowl refuge, or land of a historic site can be used for a transportation project only if there is no feasible and prudent alternative to the use of these resources, and all possible planning has been taken to minimize harm to the resource from the use. Section 4(f) applies only to the actions of agencies within the USDOT, for example, were Federal Highway Fund Administration funds being used for the project, a demonstration of consistency with Section 4(f) and review of the project under the National Environmental Protection Act (NEPA) could be required.

potentially avoid, minimize and mitigate these impacts. For example, the DEIR provides information as to the number, type and location of trees that will be removed to allow for construction of each option under consideration. The DEIR discusses an alternative to the removal of the trees that would involve the full closure of Storrow Drive during the construction period. Due to the severity of traffic and economic impacts that would result from full closure, this alternative is not considered to be practicable, and the DEIR discusses replanting plans that will be carried out to mitigate this construction impact.

It is also worth noting that open space is protected in Massachusetts by Article 97 of Articles of Amendment to the Constitution of the Commonwealth of Massachusetts. The Massachusetts Executive Office of Environmental Affairs (EOEA, now the Executive Office of Energy and Environmental Affairs) established a policy to provide guidance to EOEA agencies as to procedures that should be followed prior to the disposition (e.g., sale, transfer, lease, change of physical or legal control) of so-called Article 97 land (i.e., open space acquired for public benefit). The EOEA Article 97 Land Disposition Policy is geared toward cases in which open space interests would be lost through conversion of that open space to other purposes. *http://www.mass.gov/envir/mepa/fourthlevelpages/article97policy.htm*

Storrow Drive is a parkway within a park system. Article 97 legislative approval is not required, as neither a disposition nor change of use would be caused by adjustments to the tunnel alignment. Alignment changes of existing DCR parkways within DCR parks do not require Article 97 approval. Further, any time DCR makes any physical improvements to any of its parks or reservations, staging areas for such improvements are typically located within the DCR property, which is protected by Article 97.

- **If so, have prudent and feasible alternatives to such parkland impacts been explored and documented for each option?**

Response: While Section 4(f) does not apply, parkland impacts have been minimized to the extent feasible and consistent with the conceptual level of design for all options studied. The DEIR will discuss parkland impacts and measures designed to avoid, minimize and mitigate those impacts. The range of design alternatives reflects DCR's commitment to approaching this project not only as an opportunity to fix the existing tunnel, but to seriously examine alternatives that would benefit the park system, such as adding parkland and providing improved access. At the same time, DCR is keenly aware of the serious impacts of this major construction project. The condition and location of every tree on the Esplanade and on Back Street in the project area has been documented, and construction staging plans that include a 50 ft by 250 ft staging area and areas immediately adjacent to the roadway have been sited to harm the fewest trees possible while maintaining the necessary work area. The analysis of the options under consideration at 10% design that has been conducted to date and is presented in the DEIR is based on the experience of DCR's consultants and input from state and city agencies and the public. It is a

meaningful basis of comparison between the options, however, these issues will continue to be explored as the preferred option is brought to 25% design. The MEPA process is specifically designed to facilitate such a discussion.

- **If so, what is the legal and practical effect of 4(f) criteria on the required and/or recommended choice among the available options?**

  Response: Strict application of 4(f) criteria would not significantly affect conceptual design of any option that has been studied. All options have been designed to minimize impacts on parkland and the surrounding community to the extent practicable, recognizing that at times there are trade-offs inherent in this effort.

- **Have all such adverse impacts been identified – e.g., the potential adverse impact of construction equipment on tree root systems outside of the defined construction zone?**

  Response: All such impacts have been identified and considered conceptually. Impacts on parkland have been considered and include impacts to trees, park access, use of pathways, air quality impacts and noise impacts. Further study of these impacts will be undertaken at the 25% design phase when a preferred option has been identified. Impacts to root systems may result in areas outside the identified work area where these systems extend below the work area. All feasible measures will be taken to minimize impacts to these trees. DCR anticipates that the contract bidding documents will include significant protection for trees, especially mature ones. DCR will also consult with the Massachusetts Historical Commission to maintain the historic character of the Esplanade and protect nearby historic structures.

- **What non-Esplanade staging areas have been identified and evaluated? Have these included water-based options?**

  Response: The design team examined the areas proximate to construction activities and under DCR control for a staging area. The proposed location of the 50 ft x 250 ft staging area minimizes parkland impacts (e.g., trees, and pedestrian/bicycle paths) to the extent feasible The size and configuration of the staging area identified to date is the minimum area the design team believes is necessary to store equipment and materials that will be needed on a daily basis and would otherwise involve additional truck traffic and activities that may be considered an annoyance to residents, park users, and motorists (e.g., daily deliveries, removal of materials on a daily basis, etc.) This is the minimum area close to the work zone that we believe is necessary to practically perform the extensive demolition and construction work. This area has been recommended consistent with the conceptual level of design at this stage. More information regarding construction staging (e.g., types of material and equipment that may be stored within the Esplanade) will be available for review when the preferred option has been developed to the 25% design level.

Off-site, non-Esplanade staging areas, in addition to the one area identified in the Esplanade, will be necessary for all options studied. Water-based staging options have been considered conceptually but have been rejected due to the major practical and environmental problems associated with using the lagoon or river for this purpose. A water-based staging area would interfere with recreational use of the river and would necessitate creation of a landing area and access way through the Esplanade to Storrow Drive. Such circuitous access will be more disruptive to park users and will not be without impacts to trees (such as impacts from limbing and root compaction along the access route between the water's edge and the construction area).

❖ **What project impact mitigation plans and programs are proposed by DCR? Do these include replacement tree planting in other areas of the Esplanade?**

Response: First, DCR views this project, in part, as one of mitigation. The purpose of the project is to benefit the public by rehabilitating and reconstructing an essential component of the regional and local transportation system and by enhancing access to the park at this location. Further, the motivation for undertaking the extensive design alternative analysis and community input process is to understand if alternatives exist that might maintain the ability of Storrow Drive to serve local and regional traffic needs, while lessening the impacts of the road on the park, and to help DCR understand if trade-offs exist between parkland and access improvements and cost and traffic impacts, and whether these trade-offs are acceptable to the public.

The project will be funded by state transportation bonds. It is not anticipated that additional funds will be made available to undertake off-site mitigation projects. The mitigation currently proposed by DCR includes measures that are specifically related to potential direct impacts of the project, both construction related and long-term. The potential impacts of the project and the measures proposed to address those impacts will be presented in the DEIR, and include:

- Replant and restore trees and plants impacted by construction. Landscaping of new parkland areas created in some options (where applicable).
- Enhance pedestrian and bicycle access to the Esplanade through improved at-grade crossings or the upgrade of footbridges to widen them to more easily accommodate multiple modes of bicycle/pedestrian and wheelchair access and make them ADA-compliant.
- Upgrade utility service (water, sewer, electric) to the Esplanade.
- Develop and implement traffic management measures that include extensive outreach and communications to encourage advance planning by commuters to allow them to seek alternative routes and modes of transportation.
- Upgrade the existing stormwater management system through the use of particle seperator units.

- Participation in the DEP Diesel Retrofit Program to reduce emissions from diesel engines during construction
- Minimize noise impacts of construction through the use of a temporary noise barrier and substitution of quieter equipment where possible (e.g., use of vibratory pile drivers instead of impact pile drivers). Work will take place at night only when necessary and with proper notification to abutters.

Commissioner Sullivan has not had the opportunity to review these draft mitigation proposals in full detail, but they will be identified in the DEIR. DCR views the project as an opportunity to enhance the quality of the Esplanade and reinvigorate its capacity to serve a variety of users, whether they recreate or commute on foot, bicycle, boat, stroller, or wheelchair.

b) Relevant Roadway Design Standards:

- **Are there parkway design/operating standards – e.g., design speed, vertical clearances, lane widths, sightline distances, vertical and horizontal curvatures? If so, by whom were they developed and are they being applied to this project? How do they compare to AASHTO standards?**

Response: The underlying premise of the design of all options is being undertaken as a replacement project, essentially seeking to rehabilitate or reconstruct the current functionality of the original roadway without expanding its capacity or design speed (in fact, certain options would reduce the capacity of the roadway or particular ramps). The speed for this portion of Storrow Drive is 30 mph within the tunnel and on curved section, and 40 mph on the straight segments to the west of the tunnel. No change is proposed in the design speed or posted speed, although traffic often travels at greater speeds.

To the extent applicable, the roadway designers are following the DCR Historic Parkway Preservation Treatment Guidelines (November 2006), which reference the MHD Project Development and Design Guide (2006). Both documents call for context-sensitive design, which in the case of Storrow Drive considers the many non-transportation-related contexts (historic, recreational, aesthetic, etc.) of the area in which it is located. DCR's guidelines do not, however, include any standards or guidance for certain components of the design, such as those required to ensure the structural integrity of the bridge. In those instances where DCR's guidelines do not cover a particular topic, other standards will be followed, such as the MassHighway Bridge Manual.

DCR and MHD are in agreement that the parkway character of the roadway should be maintained. Further discussion of design standards will be provided in the DEIR.

The guidelines are available for review on MHD's and DCR's websites at these locations:

For DCR:
www.mass.gov/dcr/hpguidelines.htm

For MHD:
http://www.mhd.state.ma.us/default.asp?pgid=content/designGuide&sid=about

- **Are the current roadway design standards likely to change with the proposed shift of Storrow Drive maintenance responsibilities from DCR to MHD?**

  Response: No.

- **Would the projected effect of any such changes differ among the options – and why?**

  Response: N/A.

- **If so, would such difference have parkland, cost or other impacts that could affect the required/recommended choice among the available options?**

  Response: N/A.

- **Is it possible to change what appear to be the highway design/construction standards/practices reflected in preliminary drawings for all of the options – e.g., the use of jersey barriers, gore markings, and longer entrance ramps?**

  Response: The use of jersey barriers is not currently proposed for any option. If necessary for safety reasons, separation barriers may be used inside the tunnels but not on surface roads. Pavement markings shown on preliminary design plans are conceptual, and subject to further design review and modification, which may include use of different pavement treatments rather than paint to help guide traffic. Lengths of acceleration/deceleration lanes shown on the 10% design plans are conceptual and based on the MHD design guide (DCR guidelines do not address this issue except by generally referring to the MHD guide). To achieve a fully context-sensitive final design, all such roadway features are subject to further review, refinement, and necessary change in subsequent design phases.

c) Cost Estimates:

- **What is the relative certainty for the projected capital and maintenance costs and related construction schedules of each option?**

  Response: The relative certainty is about the same for each option studied.

- **What is the total cost of each option – capital, maintenance and any related financing costs – over the course of its total useful life?**

  Response: A detailed study of these costs over the life of the project has not been undertaken, however DCR believes the costs presented to date provide a meaningful basis on which to draw conclusions on the relative difference in cost between the options. Generally speaking, the options with the greater initial costs also have greater financing and maintenance costs, so they would be anticipated to be more expensive on an annualized or percent-value cost basis.

- **What portion of those costs is related to the construction and maintenance of the transportation infrastructure and what portion to the construction and use of any additional parkland?**

  Response: Please see Annual Maintenance Costs (2007 dollars) chart below.

	Transportation	Additional Parkland	Total Cost
Option A	$175,000	$ 25,000	$200,000
Option B	$ 75,000	$ 25,000	$100,000
Option B-3	$125,000	$ 25,000	$150,000
Option C	$250,000	$ 50,000	$300,000
Option D	$750,000	$150,000	$900,000
Option D-3	$500,000	$100,000	$600,000

Construction costs have not been differentiated between transportation infrastructure and additional parkland. Such a differentiation becomes highly subjective when new parkland is created over new transportation structures.

- **What are the comparative present-value total costs of each option based on the above considerations and sound economic principles?**

  Response: This analysis has not been performed. Please see the discussion above.

- **What is the cost and useful life of the temporary repairs now being made to the Storrow Drive tunnels? Are they required for all of the available options?**

Does the extended service life thereby provided influence the schedule/sequence of other bridge repair projects in the area?

Response: The cost of the present and interim repairs is estimated as approximately $10 million. The repairs are intended to provide a useful life of about 10 years. They are required to maintain the safety of the tunnel, so they are necessary for all options. In general, these interim repairs will reasonably extend the life of the tunnel to allow for permitting and design of the project. The final sequencing of projects in this area has not been determined at this time.

- **As a practical matter, are the more costly options feasible in the current budgetary climate and given other Storrow Drive-related priorities (e.g., required improvements to the Longfellow Bridge, the Bowker Overpass and Charles Circle)?**

  Response: The current funding climate is rapidly changing and without knowing all variables or future conditions for funding, it is difficult to speculate, but there are known significant, competing, state-wide infra-structure needs.

d) Related Transportation Plans:

- **What is the planned schedule/sequence of planned/required bridge reconstructions at the Longfellow, Craigie, Charles and Bowker locations? How will these Storrow Drive-related projects be coordinated with each other and affect the window of opportunity for this project?**

Response: Several important infrastructure projects are under development and will be under construction in the next several decades. These projects are listed in the table below. DCR is aware of the need to coordinate the construction schedules for these projects so that alternate routes or means of travel can be maintained during periods when there are delays due to the partial shut-down or the full shut-down of portions of Storrow Drive. EOT has recently appointed an Under Secretary to coordinate scheduling for the Charles River Basin projects. We anticipate that a number of factors will affect the schedule: protecting public safety; completion of final design and permitting for each project; availability of funds and source (state and/or federal).

	Description of Work	**Design and Permitting Agency**	**Bid and Construct Agency**	**Project Progress as of July 2007**
Storrow Drive Tunnel	Reconstruction or rehabilitation	DCR	MHD	10% design of options under consideration, DEIR to be filed on August 31, 2007
Longfellow Bridge	Rehabilitation	MHD	MHD	Evaluation and design underway. Immediate repairs anticipated
Boston University Bridge	Rehabilitation	DCR	MHD	Design 50% complete
Craigie Drawbridge	Rehabilitation	DCR	MHD	Design recently underway Emergency repairs under construction
Craigie Dam Bridge	Rehabilitation	DCR	MHD	Design recently underway

- **Who will decide on these matters and when?**

Response: The Executive Office of Transportation and the Executive Office of Energy and Environmental Affairs will determine sequencing of the Charles River projects in consultation with MHD and DCR.

- **What is the status and schedule of planned improvements to the Turnpike Extension (e.g., the slingshot turn-around ramp at Allston)?**

  Response: The slingshot turn-around ramp is under construction with an estimated completion scheduled in October 2007.

- **What is the status and schedule for evaluating proposed improvements to the Turnpike Extension (e.g., the study of new Back Bay on-ramps and/or off-ramps)?**

  Response: A feasibility study to add new ramps to the turnpike in the Back Bay (along the so-called Boston Extension segment of the turnpike) was undertaken in 1997. The Mass Pike did not pursue adding ramps along the Boston Extension due to a combination of engineering issues, the necessity of significant land takings (including public parkland located within the Emerald Necklace), potential impacts to historic structures, and public opposition. Transportation Secretary Bernard Cohen recently responded to Chair Elliott Laffer's query on the possibility of revisiting this topic.

- **How will any of these and other planned projects be coordinated and sequenced to minimize traffic and other disruptions?**

  Response: The slingshot turn-around ramp will be completed well before construction starts on the Storrow Drive Tunnel. New ramps are not currently planned for the Turnpike in the Back Bay. EOT has recently appointed an Under Secretary to coordinate scheduling for the Charles River Basin projects.

- **What additional MBTA and/or other public transportation services, if any, will be available to mitigate the adverse traffic affects of any and all options?**

  Response: EOT and DCR have been working with the MBTA to identify ways of increasing MBTA service and promoting the availability of commuter station parking to reduce peak hour traffic volumes during construction. The MBTA has purchased additional cars and is making switching improvements that will increase the capacity and reliability of the Green Line during construction. Other strategies - to increase ride sharing and encourage flexible work hours – will be included in the DEIR.

e) Pedestrian and Bicycle Access and Circulation:

- **What are the nature, scope and schedule of the DCR plans to improve pedestrian and bicycle access to and use of the Esplanade is area?**

  Response: Briefly, pedestrian and bicycle access improvements to the Esplanade will focus on the area immediately proximate to construction activities, and will be

scheduled to ensure that adequate access is maintained during construction, and increased once construction is complete.

All options under consideration meet or exceed access standards for park users. All crossings and footbridges will be ADA-compliant, and increasing access to the park is a design consideration of all the options.

Options A and B-3 involve the reconstruction of the Dartmouth Street and Fiedler Footbridges to make them ADA accessible. Reconstruction will include making the bridges wider and making the ramps ADA-compliant. Impacts associated with these upgrades include the loss of five trees in the case of the Fiedler Footbridge (with the exception of Option B-3, where the depressed roadway at the location of the bridge allows for a lower bridge and therefore a relatively shorter ramp). Upgrades to the bridges will benefit not only persons with disabilities, but all users of the footbridges and especially bicyclists, who will be able to transit the improved wider bridges more easily than the current, relatively narrow bridges.

Options B, C and D also include the reconstruction of the Dartmouth Street Footbridge to make it ADA-compliant; however, these options differ from the ones previously discussed in that the Fiedler Footbridge will be demolished. Access will be provided via at-grade signalized crossings at both Arlington and Berkeley Streets in Options B and C, and at Arlington, Berkeley and Clarendon in D. The additional crossings at Berkeley and Clarendon streets (an intermediate point between the existing access points at Dartmouth Street and Arlington Street) are considered access improvements. At-grade crossings are also considered preferable to the use of footbridges.

Option D-3 also includes the reconstruction of the Dartmouth Street Footbridge to bring it to ADA-compliance. The Fiedler Footbridge is demolished, and a pedestrian mall is created in its place. The pedestrian mall would create a direct, landscaped passage to the Esplanade at Arlington Street. This location not only represents an important hub of activity but is adjacent to an entrance/exit to the Public Garden and therefore would serve as a “green” link between two of Boston’s most valued parks – the Esplanade and the Public Garden. The pedestrian mall represents an opportunity for the park user to cross over to the Esplanade in a continuous park setting, and goes the furthest towards achieving a design that overcomes, at this important location, the visual and physical barrier of Storrow Drive between access to the river and parkland and the city.

These improvements will be constructed as part of the project. Construction staging charts have been provided to the advisory committees showing the timing of the individual construction stages in relation to the entire project, including the completion of reconstruction of footbridges and/or intersections. These staging

diagrams will also be provided in the DEIR, and will give a rough idea of at what point in the overall construction process these facilities will be open for public use.

In addition, DCR is planning to repair and improve the Granite Overlooks and Storrow Lagoon as part of another project. This work includes separating paths for bicyclists and pedestrians, replacing boat docks and improving the boating experience and landscaping changes. DCR is working with another advisory group (with some overlap in membership) on this project. Funding is in hand for several elements of this project.

- **How might those plans be affected for better or for worse by the various Storrow Drive reconstruction options now on the table? How might such options be modified to enhance pedestrian and bicycle access and circulation?**

  Response: In general, all options studied improve pedestrian and bicycle access to and from the Esplanade by providing either new at-grade crossings or new replacement footbridges with wider decks and ADA-compliant inclines on ramps. Options D and D-3 provide the best pedestrian and bicycle access via an at-grade pedestrian promenade connecting between the Esplanade and Public Garden area.

- **How will plans be affected by the Storrow Drive reconstruction process itself; and what mitigation programs are proposed to mitigate those construction-period effects?**

  Response: In general, temporary ADA-compliant footbridges will be provided in all options while existing footbridges are being demolished and new ADA accessible pedestrian and bicycle access is being reconstructed. Related to a response above, other Esplanade projects are continuing to proceed while planning and design are underway on Storrow Drive (see the comments above on the Granite Overlooks Project).

B. WITH RESPECT TO THE GROUNDWATER EFFECTS OF THE TUNNEL OPTIONS - Options A, C, D, D-3:

- **What are the comparative groundwater effects among the tunnel options and what are the measures to be taken to deal with them?**

  Response: All options potentially eliminate groundwater infiltration into the Storrow Drive tunnels and boat sections. Elimination of all tunnels and boat sections in Option B obviously eliminates all infiltration into tunnels and boat sections. This infiltrated water is currently pumped without treatment into the Charles River. In the Option B series, sub-grade structures will be modified; complete removal of the sub-grade structures below four feet grade is not proposed, but modifications such as cutting holes or slots in the existing walls and base slabs that are left in the ground, before backfilling are proposed.

While all of the options provide some incremental improvement of the existing groundwater conditions, the actual magnitude of the benefit cannot be quantified at this time, due to the unknown impacts of other potential sources of groundwater drawdown in the area. The investigations and analyses that have been performed to date indicate that these other potential sources of groundwater drawdown could have an overriding impact that limits the potential benefit from the tunnel reconstruction project.

- **How do these and the groundwater effects of the existing tunnels comport with the requirements of the new groundwater protection overlay district?**

  Response: Facilities located on state property are exempt from local zoning requirements; however, the City of Boston and Commonwealth of Massachusetts have formed a City/State Groundwater Working Group to coordinate efforts to maintain groundwater levels in Boston. DCR is committed to providing, as part of this project, groundwater and storm water recharge measures that our engineers and consultants consider to be technically and environmentally practicable, effective and prudent, and appropriately scaled to the possible impacts. .

- **What are the source(s) of groundwater recharges? If surface run-off is among those options, does that comply with related pollution control regulations?**

  Response: The sources of groundwater recharge are: (a) stormwater that runs from the boat sections and tunnel to drains connected to the pumping system, and (b) any groundwater that infiltrates into the tunnel or boat sections and is then collected and sent to the pumping system. (The tunnels will be constructed to eliminate groundwater infiltration but some groundwater infiltration is inevitable, so the recharge system is designed to deal with this circumstance).

  Surface runoff (i.e., stormwater) is regulated by the DEP's Stormwater Management Policy and Guidelines. The project would fall under the "redevelopment standard", for which no specific performance standards are set, aside the requirement that stormwater management systems must be improved as compared to the existing conditions. Accordingly, stormwater runoff from boat and tunnel sections will be treated prior to discharging to any infiltration system, and infiltrated to assist in replenishing groundwater levels.

  Runoff from surface roadways, as opposed to boat and tunnel sections, is currently not proposed to be used for groundwater recharge in any option.

- **Have the costs of such recharge systems been calculated into the capital and maintenance costs of these options?**

  Response: Yes

C. WITH RESPECT TO THE COST AND SCHEDULE PROJECTIONS FOR THE NEWER ALTERNATIVES – Options B-3, C, D-3:

- **Is it likely that the further review and refinement of these options can improve the construction sequencing for these options that will have favorable impact on its cost, schedule or other significant variables?**

  Response: Further review and refinement of every option will improve the reliability of its estimated cost, schedule and other variables. For the purpose of comparative evaluation of alternatives in the DEIR phase, estimates of costs and impacts for Options C, B-3 and D-3 have the same reliability as the other options studied. Other significant variables involving the impact of the final design include regional and local traffic impacts, groundwater impacts, and parkland impacts. These impacts have also been analyzed using consistent assumptions and allow for comparison between options. DCR believes that the analysis of these options at 10% design is adequate in understanding the differences between the options and allows for a meaningful comparison of the options.

- **Are the construction assumptions for these options – e.g., the extent of daytime, evening and nighttime work – comparable? If not, could they be made comparable to better evaluate these options?**

  Response: Yes, the construction assumptions for these options are comparable and the information provided can reliably be used to draw comparisons between options. The prior temporary bypass road would have eliminated most nighttime work

- **If so, how might those effects impact its relative attractiveness as an option?**

  Response: Construction duration and length of severe traffic impacts are provided below.

  - Option A: 2.4 years (13 months most severe traffic impacts)
  - Option B: 1.9 years (12 months most severe traffic impacts)
  - Option B-3: 3.5 years (27 months most severe traffic impacts)
  - Option C: 3 years (23 months most severe traffic impacts)
  - Option D: 5 years (30 months most severe traffic impacts)
  - Option D-3: 4.2 years (33 months most severe traffic impacts)

  Additional information related to the benefits and drawbacks of each option will be presented in the DEIR.

D. WITH RESPECT TO OPTION B-3:

- **Where does the 50% of the traffic that is diverted from Storrow Drive, but is as yet unaccounted for, actually end up? What, if any, incremental traffic impacts on local streets in the Back Bay, with particular attention to peak commuting periods?**

  Response: Because there is no westbound on-ramp at Berkeley Street in Option B-3, the CTPS travel demand model results for 2030 indicated that about 1,100 vehicles have to find another way west during the morning peak period: 18% use the Mass Turnpike; 9% get on Memorial Drive; 40% enter Storrow Drive at Charlesgate or Charles circle; and others use local roads. In the PM peak period, the 2,200 vehicles that used the Berkeley Street westbound on-ramp would use Charles circle (20%), Charlesgate (48%) the Mass Turnpike (11%), and other local roads.

- **Are there any traffic calming or other measures that can be developed to mitigate any of the potentially adverse local traffic impacts?**

  Response: Traffic calming strategies have not been considered at this preliminary level of design. Use of traffic calming and other mitigation strategies will be investigated once an alternative has been selected and final design begins.

- **Can the effect of the loss of local access due to the elimination of eastbound Arlington and Berkley be fairly and realistically tested before this option might be approved?**

  Response: Because this alternative (Option B-3) only requires opening or closing existing ramps, a field test is possible, but would require extensive coordination with the Boston Transportation Department, Boston Police Department and area hospitals to ensure that emergency personnel are informed prior to such testing. Most alternatives, however, would require the construction of at least one new ramp, and they could not be field tested. Therefore, the fairest comparison remains the transportation analysis conducted and presented for each option.

- **What improvements at Charles Circle and the Bowker Overpass would be required to address and resolve the traffic impacts of this option at those locations? What are the estimated costs of such improvements? Are they required/recommended in any of the other options? Can they be completed before this project in undertaken?**

  Response: At this time there are no plans to modify Charles Circle. Potential improvements to the Bowker Interchange westbound on-ramp have been investigated. Under certain build options, traffic projections in this area indicate that Storrow Drive could be reduced to one lane between the westbound off- and on-ramps at the Bowker Interchange. The westbound on-ramp would then become a

lane addition to Storrow Drive, instead of a merge, and Storrow Drive would continue to depart the Bowker Interchange as two lanes.

The cost of implementing this modification would be relatively inexpensive and would require removing the existing pavement markings, placing new pavement markings, and installing new signage. This solution is recommended for final build options B, B-1, and B-3; and for all construction phases where the westbound on-ramp from Berkeley Street is closed.

This solution is not recommended for implementation under existing conditions or under the remaining final build options. In these cases, the traffic volumes on Storrow Drive are projected to be greater than the capacity which could be provided by one lane during the peak hours of an average day.

NOTE: In all Options, the eastbound entrance from Mugar Way will be improved prior to commencement of construction to safely accommodate traffic detours during construction.

- **Since the necessity of a third westbound lane of Storrow Drive is eliminated in this option, would it be possible to increase the width of the Esplanade between Berkeley and Fairfield Streets at the Dartmouth Lagoon, where the width of the heavily used pedestrian pathway is now limited to about ten feet?**

  Response: Yes.

- **Might this option be enhanced by the availability of traffic signals that might permit at grade pedestrian crossings possible, evening, weekend, holiday and event uses —and for emergency situations?**

  Response: Traffic signals are not recommended for use under the proposed conditions. Use of traffic signals in this situation would lead to inconsistent operation, which could reduce safety for crossing pedestrians and approaching vehicles. It is suggested that pedestrians be allowed to cross at-grade only during special events or emergency situations under the control of Park Rangers or State Troopers utilizing gates or other moveable barriers.

E. WITH RESPECT TO OPTION A:

- **What would be the projected cost, schedule and other variables for this option with a useful life of 75 years?**

  Response: The rehabilitation option currently has a 60-year useful life with replacement of all existing tunnel roofs with new ones. This information was included in the summary options table sent to the advisory committees, but since it was in a footnote, readers may have missed the information. SGH is also evaluating a 75-year rehabilitation that would not require complete demolition of the existing structures; rather they would be retained as a shell into which an entirely new, independent structure would be accommodated.

- **What are the other qualitative costs of a shorter useful life (e.g., necessary community process, additional neighborhood disruptions, uncertainty of outcome, etc.)?**

  Response: In Option A the entire tunnel roof is replaced, and the walls and floor are reinforced from the inside of the tunnel. Major renovations would be needed sooner for A than for a surface parkway or new tunnel that could be constructed to current engineering standards. If this version of Option A were simply to be rehabilitated again in 60 years, the chief factors would be construction impacts to the neighborhood and traffic, cost and other factors we simply can't predict without knowing if there would be other changes in the regional roadway system or in Back Bay and Beacon Hill.

F. ADDITIONAL QUESTIONS FROM THE COMMENT LETTERS:

1. **Is there a way to decrease the number of trees lost during construction, especially in Option D-3? (Sharon Malt)**

   Response: We believe the current estimate of tree loss is reasonable given the extent and complexity of tunnel construction. As stated earlier, during construction, we will do everything possible to protect mature trees located at the northerly edge of the construction zone. Also, a special maintenance program for trees close to the construction will be included in the construction contract.

2. **Are there safety and ADA comparisons to be made between A, B-3 and D-3 in evaluating the rebuilt Fiedler versus at grade?**

   Response: Regarding ADA accessibility, all three options (A, B-3, D-3) will meet ADA guidelines. Option D-3 includes an at-grade pathway at Arlington and is therefore easier to use for both pedestrians and cyclists as far as moving from Beacon Street/Public Garden into the Esplanade. It may even be possible to have separate paths into the Esplanade for bikes and pedestrians. Options A and B-3 both have new, wider, accessible pedestrian bridges that will be safe for use. Option B-3 may be somewhat easier to use since it is lower to the ground, has shorter approach ramps and may not have a "switchback" ramp on its southerly end. Option D-3 may be somewhat safer during major Esplanade events only because there will be more space at-grade to accommodate "surge" crowds coming and going.

3. **How long will it take to restore the landscape of the parkland (A, B-3 and D-3) when construction is complete? (Sharon Malt)**

   Response: Generally, landscape restoration will take approximately 4 to 6 months to complete.

4. **Can vestiges of the 1950s be eliminated in favor of a design that better reflects Arthur Shurcliff's influence? Will the parkway have the look and feel of Memorial Drive? (Sharon Malt)**

   Response: Once further design commences, DCR will select which period the landscape design should best reflect given current uses, existing tree locations and space available. As new planting matures and with proper maintenance, the landscape can develop the look and feel of Memorial Drive, although the traffic flow will be greater, which has a significant impact on pedestrians' and bicyclists' experience of being alongside these two parkways.

5. **Are there ways for DCR to ensure that the project stays on or ahead of schedule? (Sharon Malt)**

   Response: DCR will work with MHD, which will bid and manage the construction contract, to build safeguards and incentives, as much as possible, into the project.

6. **While D3 and A appear to have upgraded storm water recharge systems built in, what storm water clean up system does B3 offer?**

   Response: Option B3 has a treatment and ground water recharge system for runoff/infiltration in the boat sections, and a storm water treatment system for roadway runoff from surface roads.

7. **Will the at-grade traffic of B3 adversely impact the neighborhoods and Hatch Shell events with additional noise and pollution?**

   Response: With regard to air pollution, the results of air quality modeling (which compares standards established by EPA for health and human safety) performed for the options under consideration indicate that differences in air quality between options are relatively minor. Air quality improvements that would otherwise be gained through the reduction in capacity of Storrow Drive in some options (Option B and Option C) are offset by increased idling times in these options. In other options, air quality at the modeled intersections get slightly better or worse due to the affect of changing ramp patterns and traffic volumes at these intersections. For Option B-3, emissions from cars are slightly increased at Beacon St/Berkeley St in the AM peak period and slightly decreased in the PM peak period. At Beacon St/Arlington St, emissions are slightly increased in both AM and PM peak periods. However, as stated previously, these differences are not considered significant.

   With regard to noise, sound levels would increase at most areas adjacent to Storrow Drive in the study area for Option B. This is due to the fact that a portion of roadway will have been brought to the surface where it is currently below grade, thus removing the shielding effect of the tunnel adjacent to the residences. However, in most instances,

the change in noise levels will be in the range that is barely perceptible to the average human ear.

A detailed discussion of both air quality and noise impacts will be presented in the DEIR.

8. **What input will neighborhood residents have in the decision-making on the various options? At what phase will that occur? (SM)**

   Response: Neighborhood residents have participated in the advisory committees and the public meetings held on the project. DCR plans to hold an informational session on the DEIR and welcomes questions and comments in those sessions, in writing or via the public involvement process.

9. **How would traffic be affected by fees on Storrow Drive (CRC).**

   Response: It would be very costly to implement a fee system that worked like Easy Pass or its equivalent since cars enter Storrow Drive at so many locations (unlike the Mass Turnpike), and each entrance ramp would need to be outfitted with transponder or other toll collection equipment. To accommodate drivers that do not have transponders, a monetary system would need to be implemented on ramps, which are typically not very long and could easily back up onto city streets. The state commission on transportation is examining these kinds of issues.

10. **CLF's letter asks for air emissions data on all of the options and suggests it should be an important factor in selection of a preferred alternative; along with impacts on climate change; evaluation of potential to address short-term and long-term mobility needs through multi-modal alternatives and in context of ongoing long-term transportation planning.**

    Response: A microscale and mesoscale air quality analysis was done for the options under consideration to determine the effect on air quality of each option. The microscale analysis consists of ground level CO impacts due to traffic queues in the immediate vicinity of the project. The mesoscale analysis evaluates the regional mobile source air quality effect of the proposed project. The mesoscale analysis provides an assessment of volatile organic compounds (VOCs), oxide of nitrogen (NO_x), particulate matter (PM10) and carbon dioxide (CO_2) emissions from motor vehicles in the project area (NOx, VOCs and CO_2 are greenhouse gases).

    The results of these analyses indicate that differences in air quality between options are relatively minor, and therefore air quality is not an important criteria in highlighting differences between the options. Air quality improvements that would otherwise be gained through the reduction in capacity of Storrow Drive in some options (Option B and Option C) are offset by increased idling times in these options. In other options, air

quality at the modeled intersections get slightly better or worse due to the affect of changing ramp patterns at traffic volumes at these intersections.

11. **MASCO would like data on how much of traffic using the Charlesgate/Fenway ramps (Bowker Overpass) is destined for LMA.**

    Response: Beta is working on a report containing this data and will make it available when it is complete.

12. **In B-3, the westbound vehicle traffic capacity is described as "equivalent" because "The loss of one westbound lane on Storrow Drive west of Berkeley Street is matched by a reduction in demand for that lane." MASCO would like to understand more about the change in demand for the lane and how the diverted vehicles could impact local roadways.**

    Response: The reduction in demand is caused by the elimination of the Berkeley Street westbound on-ramp. The effects of this change have been presented in the traffic modeling results for Option B-3.

13. **What would impacts be of complete shutdown of Storrow Drive during construction to lower costs and shorten the construction period.**

    Response: Full shutdown would reduce construction duration and costs for all options, but these potential benefits have not been further studied or quantified because the transportation and economic impacts of full shutdown have been judged to be unacceptably severe.

14. **Walk Boston poses questions about daily and special event volume numbers for pedestrians; for an analysis of the functional pathways in the Esplanade; and for design standards for pedestrian and bike paths.**

    Response: As Walk Boston correctly points out, data is lacking at this 10% level of design to provide a true pedestrian level-of service analysis for any of the Options. Going forward, the Design Team is hoping to obtain such data from current studies being undertaken by the Esplanade Association and DCR.

15. **Several ~~commenters~~ commentors asked how DCR and MHD plan to finance maintenance of Storrow Drive.**

    Response: Governor Patrick recently announced that he has directed Secretary Ian Bowles and other Cabinet Secretaries to begin relieving DCR of duties outside its core responsibilities so the agency can concentrate on its core mission. It is anticipated that MassHighway will assume responsibility for roadway maintenance from curb to curb, with DCR continuing its ownership of the parkway and remaining responsible for for setting standards as well as maintaining landscape elements along its parkways. It has not yet been determined whether funding mechanisms will differ from current practices

16. **Will Hatch Shell events be eliminated during construction?**

    Response: The Esplanade and the Hatch Shell will be available for use during construction.

17. **Has the team examined accident data? Need to avoid adding any dangerous aspects to roadway.**

    Response: Beta has reviewed accident data along Storrow Drive and at all study area intersections. Maintaining the safety of pedestrians and drivers along Storrow Drive is a principal goal of the design team.

17. **If repairs have stabilized the Storrow Drive tunnel, shouldn't Longfellow Bridge be the priority to protect the Red Line.**

    Response: MHD is managing design of the Longfellow Bridge Restoration in consultation with DCR. MHD, DCR and their consultants are inspecting and making repairs to the bridge and to the Storrow Drive tunnel as needed. A decision on which project moves to construction first depends first on safety, then on when the respective designs are complete, permits received and funding is in place.